Trig Final (SLTN v666)
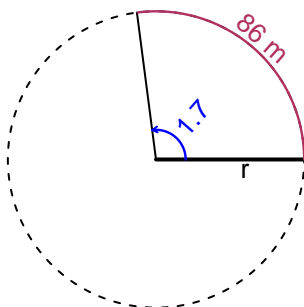
- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 1.7 radians. The arc length is 86 meters. How long is the radius in meters?
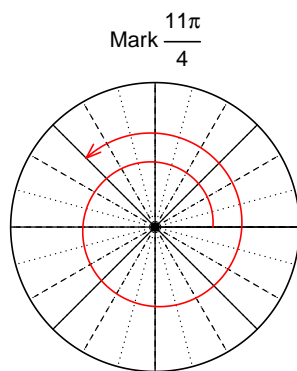

$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$
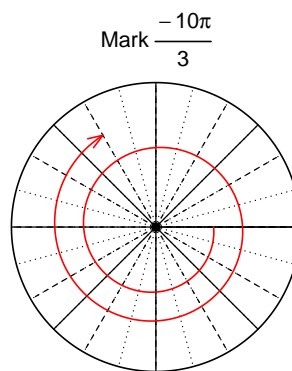
$r = 50.59$ meters.

Question 2

Consider angles $\frac{11\pi}{4}$ and $\frac{-10\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{11\pi}{4}\right)$ and $\sin\left(\frac{-10\pi}{3}\right)$ by using a unit circle (provided separately).

Mark $\dfrac{11\pi}{4}$

Find cos(11π/4)

Mark $\dfrac{-10\pi}{3}$

Find sin(−10π/3)

$\cos(11\pi/4) = \frac{-\sqrt{2}}{2}$
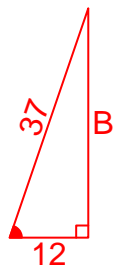
$\sin(-10\pi/3) = \frac{\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{-12}{37}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.
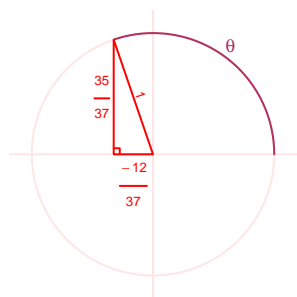
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.

Solve the Pythagorean Equation

$$12^2 + B^2 = 37^2$$
$$B = \sqrt{37^2 - 12^2}$$
$$B = 35$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.

$$\tan(\theta) = \frac{\frac{35}{37}}{\frac{-12}{37}} = \frac{-35}{12}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 7.64 meters, a frequency of 3.87 Hz, and a midline at $y = 2.3$ meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 7.64\cos(2\pi 3.87t) + 2.3$$

or

$$y = 7.64\cos(7.74\pi t) + 2.3$$

or

$$y = 7.64\cos(24.32t) + 2.3$$